

# **The Urban Water Management Plan**

## **for the**

### **City of Glendale**

The City of Glendale is a dynamic community. We are committed to the well being of all people who live in, work in, or visit our City.

We are proud of Glendale's history of accomplishment. Through visionary leadership, we build on this tradition of success by enacting fair legislation and providing quality services to ensure a community environment that is safe, healthy and enriching.

We are a team dedicated to a well governed, professionally managed, responsive, and fiscally sound City that creates opportunities for all to enjoy life, grow, and prosper.

**December 2005**

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## I. INTRODUCTION

### A. URBAN WATER MANAGEMENT PLANNING ACT

The purpose of this document is to comply with the Urban Water Management Planning Act (UWMPA) contained in the California Water Code, Division 6, Part 2.6 Sections 10610 through 10656. It was added by Statute in 1983, Chapter 1009, and became effective on January 1, 1984. The Act, known as Assembly Bill 797 while pending before the Legislature, has been amended five times since it was adopted.

The Act requires that “every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually prepare and adopt an ‘urban water management plan’ for submittal to the State Department of Water Resources (SDWR)”. The act also requires that the plan be periodically reviewed for changes and that an update is submitted to SDWR every five years. The plan shall describe and evaluate the practical and efficient uses of water and the degree of usage of reclamation and conservation activities. The Urban Water Management Plan requires a detailed evaluation of water supply and demand at least twenty years into the future. Suppliers must provide analyses of the following:

- Service area and projected population.
- Existing and planned sources of water, including groundwater.
- The water supply’s reliability during average, single-dry and multiple-dry water years.
- Past, current, and projected water use.
- Exchanges and transfers.
- A supply and demand assessment over five year increments to twenty years for average, single-dry, and multiple-dry water years.
- Current and planned water demand management measures.

- Current and planned water supply projects.
- An urban water shortage contingency plan.
- Recycled water as a potential water source.
- Quality of existing water sources.
- Desalination as a potential water source.

City of Glendale prepared its initial Urban Water Management Plan in 1985 and updated it in 1990, 1995, and 2000. The Glendale's 2005 Urban Water Management Plan is prepared by the City of Glendale Water Department. This document is a revision of the 2000 report, outlining the numerous changes that have occurred in the City for the last five years. The City is very active in the development of local water resources and has implemented many of the Best Management Conservation Practices including the greater use of recycled water.

This report will discuss the water resource programs, water shortage contingency plans and water conservation activities being conducted and proposed in the future. Glendale's City Council has established many policies and activities to encourage the efficient use of water and will continue to expand this effort.

## **B. CITY OF GLENDALE**

### **Formation and Location**

In 1798, Corporal Jose Maria Berdugo (later changed to Verdugo) established title to the Rancho San Rafael. The Rancho included most of present-day Glendale, Burbank, Eagle Rock and Highland Park. In 1861, the rancho was divided between the son and daughter. A court decision known as the "Great Partition" was made in 1871 dissolving Rancho San Rafael. With the creation of smaller parcels, six individuals contributed land to create the original 150-acre town site, which was named Glendale. In 1887, this was platted, filed, and recorded with the County Recorder as the "Town of Glendale". It was later incorporated to a City in 1906 consisting of 1,486 acres. From 1920 to 1930, through nineteen annexations, the City had

grown to 12,294 acres. With more annexations that followed, the City grew to 30.6 square miles. With a population of 201,300 in 2005, Glendale is the 3<sup>rd</sup> largest city in population in Los Angeles County. The City is located north of the City of Los Angeles and between Burbank and Pasadena, as shown in Figure 1.

## **Government**

The Council-Manager form of government governs Glendale. Five council members are elected-at-large and serve 4-year staggered terms. The Council votes every year to elect one member to the position of Mayor. Other elected officials include City Clerk and City Treasurer. The City Manager and City Attorney are appointed by the City Council. Other managerial positions are filled by the City Manager.

Management personnel are under the supervision of the City Manager. The entire organization consists of over 1,700 full-time employees and 500 part-time employees, and is divided into 14 departments headed by a manager.

## **Glendale *Water & Power***

Glendale's water, electric, and power systems are operated within the City's Glendale *Water & Power* (GWP) Department (previously Public Service Department) as an enterprise organization.

A Director with three administrators (Power Management, Water Services and Electrical Services) oversees operations of the various organizational units.

A five-member *Water & Power* Commission, appointed by the City Council, oversees the activities of the GWP. They also sit as an Appeals Board for Water Conservation Regulations relief applications by customers.

The Water Services Administrator oversees the field operation and office engineering sections. The field activities are headed by the Water Superintendent and the office activities by a Principal Civil Engineer. Field operation is responsible for the operation, maintenance, and construction of water facilities while engineering takes care of planning, design, monitoring and evaluation, water quality, and regulatory compliance and implementation. A total of fifty-two full time employees comprise the Water Department.

### **Water System (Potable & Recycled)**

The City currently has 31,063 water customers serving a population of 204,435 and covering 30.6 sq. miles. Crescenta Valley Water District serves about 8,000 citizens in Glendale. The potable water system consists of 378 miles of water mains, 28 pumping stations, and 30 reservoirs and tanks. It also includes two treatment plants: Verdugo Park Water Treatment Plant and the Glendale Water Treatment Plant.

The service area is divided into seven pressure zones from the 724-foot elevation to the 2,503-foot elevation. Because of this wide variation in service elevations, pumping stations are needed to lift water from the lower zone to the next higher level. Statistical information at the City's water system is provided on Figure 2.

### **Electric/Power System**

The City of Glendale operates its own electrical generation, transmission, and distribution facilities. The City purchases approximately 75-85 percent of its electric and energy needs from many outside sources with 15-25 percent generated by the City's 239-megawatt Grayson Power Plant. Since 1995, modifications to the existing power generation units were made to lower the emission requirements as mandated by the environmental regulations. Improvements and life extension projects are currently underway to the different power units to make them more efficient and extend the life of the equipment.

The City has purchased two new transformers to replace the existing aging ones to improve the reliability of the system. There is a 12 to 15 year plan to replace existing lower voltage distribution lines from 4 kV to 12 kV operations.

### **C. PLAN PREPARATION**

The Glendale *Water & Power* (GWP) Commission on October 3, 2005, conducted a public hearing on the Urban Water Management Plan (UWMP) after notice of the hearing was published in the Glendale News-Press, posted on the City's web page at [www.ci.glendale.ca.us](http://www.ci.glendale.ca.us), and televised on the local public access station. All notifications stated that copies of the report were available at the Glendale Central Library and offices of Glendale *Water & Power*. Copies of the draft Urban Water Management Plan were sent to the City Council Members and *Water & Power* Commissioners on September 15 for their review and comments. The Glendale City Council conducted an additional public hearing on the UWMP and adopted it on November 8, 2005. Notice of the hearing was published twice in the Glendale News Press.

The adopted plan was submitted to the State Department of Water Resources after its adoption.

### **D. AGENCY COORDINATION**

This UWMP was prepared in coordination with the Regional Urban Water Management Plan (RUWMP) prepared by the Metropolitan Water District of Southern California (MWD) and the UWMP prepared by City of Burbank and Pasadena Water Departments. The City of Glendale is a member agency of MWD and therefore a beneficiary of their water management plans. Some information presented in this report was obtained from MWD's RUWMP and the UWMP of City of Burbank and Pasadena Water Departments. Also, there is data in this report that was obtained from the City's Planning and Public Works Departments.

## II. WATER USE

The fiscal year 2004-05 annual water consumption for the 204,435 people served by the City of Glendale was 29,620 acre-foot (AF), including 1,300 AF of recycled water. About 8,000 of the City's residents are served by the Crescenta Valley Water District. This level of use was the result of above-normal rainfall. Under dry-weather conditions, such as in the year 2003-2004, the use of water reached 35,625 AF, an all time high for Glendale. An acre-foot of water is 325,850 gallons of water. Typically, single-family residents use 20 billing units per month (15,000 gallons) or 0.5 AF/Yr. Historically, water use decreased significantly in the early 1990's compared to the late 1980's because of drought conditions and the request for a mandatory reduction in water use. As the drought memory fades and continuing increase in population and reduced local rainfall, the trend of annual water use in the City is increasing.

### A. DEMOGRAPHICS

The City of Glendale is the third largest city in Los Angeles County, following Los Angeles and Long Beach. Based on the 2004 report published by Southern California Association of Governments (SCAG), Glendale's population of 204,435 resident's accounts for 1.99 percent of County's total population. This is an increase of 4 percent from the 2004 SCAG Growth Forecasting Report, or a net increase of 8,654 people. The population is expected to continue to grow at a relatively small rate.

With respect to housing, Glendale has one of the highest concentrations of multi-family housing in the area. There has been a substantial growth in new development in the City consisting of commercial buildings and new multi-family housing, such as apartments and condominiums. There are only a small number of single-family development projects occurring in the City consisting primarily of infilling and small subdivisions. The redevelopment primarily consists of the destruction of old single-family homes in the downtown area of the City and the construction of multi-family housing.

This situation is evident by the number of water services assigned to single-family and multi-family homes over the past five years. The meter count in the Glendale system has not significantly changed over the past 10 years, even though population has been growing annually. Small water service lines for single-family housing are being replaced with larger services for multi-family housing. Over the next 20 years, population is expected to increase by 8.3 percent, which is about 0.4 percent per year. However, employment is expected to increase about 3.1 percent reflecting the commercial growth in this City. The proportion of multi-family housing to total housing in the City is expected to continually increase.

Historic and projected population, housing and employment for the City of Glendale are shown in Table II-1

**Table II-1**  
**Demographic Information for the Glendale Area\***

	<b>2000</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>
<b>Population</b>	195,800	204,435	207,200	211,220	215,200	219,000
<b>Households</b>						
Single-Family	28,577	29,039	29,493	30,138	30,727	31,364
Multifamily	42,223	43,921	44,607	45,582	46,473	47,436
Total Households	71,800	72,960	74,100	75,720	77,200	78,800
<b>Persons per Household</b>	2.88	2.89	2.89	2.89	2.88	2.88
<b>Total Employment</b>	<b>85,700</b>	<b>88,020</b>	<b>90,500</b>	<b>93,550</b>	<b>96,750</b>	<b>99,800</b>

\* SOURCE: SCAG 2004 Growth Forecasting – City Projections

## **B. TOPOGRAPHY**

The City of Glendale is located in Los Angeles County, California adjacent to the Verdugo and San Gabriel mountains. Glendale's topography consists of broad valley plains, canyons and mountainous areas. The lowest elevation served is at 416 feet above sea level near Tyburn Street and the Southern Pacific right-of-way in southern Glendale. The highest elevation served is 3,120 feet in the Verdugo Mountains and ranges up to 4,800 feet near Mount Lukens in the San Gabriel Mountains. About 48 % of the service areas are at the 724 and 968 service zones and the rest lay between the 1280 to the 2483 service zones. Due to this terrain condition, as described above, the water service area is divided into seven pressure zones as shown in Figure 3, the potable water system schematic diagram and Figure 4, recycled water system schematic diagram.

## **C. CLIMATE**

The major feature of the City's climate is mild, with an average temperature of 75°F. Summer temperatures are commonly above 85°F and may exceed 100°F for several consecutive days. Conversely, temperature could go as low as the 30's °F during winter. Annual average rainfall for the last ten years was approximately 18 inches. Figure 5 summarizes the historical average rainfall in the service area in the last 25 years. More than 70 percent of the region's rainfall occurs in the period between December through March.

## **D. PER CAPITA WATER USE**

Glendale per capita water use in Table II-2 shows that the current per capita use is about 143 gallons per day. Per capita water use does not reflect the actual amount of water used by an individual because it includes all categories of urban water use, including residential, multi-family, commercial, industrial, irrigation and other. A number of factors affect per capita water use, including the relative share of residential versus non-residential water use in an

area, the number and type of housing units, the number of employees, the types of businesses, persons per household, lot sizes, income levels, and climate. It is also dependent on weather conditions. During hot and dry years, the per capita use is much higher because of the increase in demand primarily for irrigation needs. It is common for water agencies to develop this information for comparison with other communities. Information is provided on the 2005 per capita use in Los Angeles County at 168 gallons per capita, which is 15 percent higher than experienced in Glendale. It shows that Glendale's per capita use is less than per capita use for the County as a whole, reflecting Glendale's larger proportion of multi-family housing which has lower landscape irrigation demands, and conservation efforts.

**TABLE II-2**  
**MUNICIPAL AND INDUSTRIAL PER CAPITA WATER USE**  
**(Gallons per person/per day)**

<b>Fiscal Year</b>	<b>Population <sup>(1)</sup></b>	<b>Water Use (AF)</b>	<b>Glendale Per Capita Use gals/day</b>	<b>Los Angeles County Per Capita Use gals/day <sup>(2)</sup></b>
2000 - 01	187,800	32,270	152	174
2001 - 02	189,512	29,663	138	-
2002 - 03	191,243	31,192	144	-
2003 - 04	192,973	33,560	153	-
2004 - 05	194,704	32,631	143	168

(1) Service area population (City population less the 8,000 persons served by Crescenta Valley Water District)

(2) From MWD's Regional Urban Water Management Plan

## **E. WATER PROJECTION METHODOLOGY**

To forecast retail water demands, Metropolitan uses an econometric model, the MWD-MAIN Water Use Forecasting System, which relates water use to independent variables such as housing, employment, income, price, and weather. Many water resource agencies across the country use a similar version of this model including the U. S. Army Corps of Engineers, the U. S. Geological Survey, the state of New York, the cities of Phoenix, Las Vegas, and Portland, and some of Metropolitan's member agencies.

The model's demographic and economic variables are based on the Southern California Association of Governments (SCAG) Regional Transportation Plan and the San Diego Association of Government (SANDAG) 2020 Forecast. Metropolitan contracted with the Center for Continuing Study of the California Economy (CCSCE) and SCAG to extend these projections to 2050. SCAG and SANDAG demographic projections are supported by environmental impact reports and based on city, county and regional general plans. Glendale uses the results of the MWD modeling effort in developing long-term water demands in the City.

## **F. WATER DEMAND**

Water use by customer category in year 2004 is shown in Figure 6. We observe:

- Four-fifths of total water use is associated with residential water use:
  - 44 % with single family
  - 37 % with multi family
- Commercial users consumed 15 %
- Irrigation users, include both residential and commercial, used 2 %, and
- The remaining 2 % was consumed by industrial users

The projected water demand using MWD-MAIN calibrated for Glendale shows the overall

“normal water” demand for year 2005 to be 32,631 AFY, and for year 2025 demand of 38,600 AFY. These water use projections are based on projected population, housing, and employment, as incorporated in the Glendale General Plan. The data obtained from the Glendale Planning Department and those of the Southern California Association of Government were programmed into the MWD-MAIN water demand forecasting model for Glendale including variable weather conditions. The year 2025 demand reflects a modest increase over current use on the order of 10 percent as Glendale is essentially “built-out”. These projections incorporate the 1981 and 1992 California plumbing code changes requiring ultra-low flush toilets beginning in 1992, along with a continuation of current drought oriented public education and information programs. As additional conservation measures are carried out, there could be still more reductions in projected use.

The Glendale potable water system receives its water from two basic sources: local groundwater from the San Fernando and Verdugo Basins and imported surface water from Metropolitan Water District (MWD). Figure 25 shows the projected water demand of MWD water in the next five years. Currently, the Glendale local groundwater system contributes approximately 30% of potable water used in the City. The objective of the City’s Water Resource Plan, first prepared in 1985, is to develop more local supplies and identify the facilities to increase the use of local resources thereby reducing the need for imported water. The cost of these new facilities is \$50 million.

Currently, 70 percent of the potable water used in the City comes from the MWD. With the additional supplies and facilities, operation of the Glendale Water Treatment Plant (GWTP) and increased recycled water use, the goal in reducing dependence on the MWD has been accomplished.

Table II-3 shows the current and projected water supplies from the various sources to meet water demands. More information on the sources of supply will be provided in the next section on water demands. In reviewing the water demands, they are expected to increase by

about 10 percent over the next 20 years recognizing that anticipated population growth in the City is minimal.

**TABLE II-3**  
**CURRENT AND PROJECTED SOURCES OF WATER SUPPLY (AF)**

<b>Water</b>	<b>San Fernando</b>	<b>Verdugo</b>	<b>Recycled</b>	<b>MWD</b>	<b>Total</b>
<b><u>Year</u></b>	<b><u>Basin</u></b>	<b><u>Basin</u></b>	<b><u>Water</u></b>	<b><u>Water</u></b>	<b><u>Supply</u></b>
1998-99	409	2,720	1,458	26,605	31,192
1999-00	516	2,451	1,742	28,851	33,560
2000-01	673	2,105	1,664	29,033	33,475
2001-02	4,013	2,120	1,500	26,264	33,897
2002-03	8,495	1,551	1,376	21,896	33,318
2003-04	7,872	2,174	1,517	23,774	35,337
2004-05	6,466	2,208	1,298	22,666	32,638
2010	7,625	2,300	2,010	21,889	33,824
2015	7,625	2,300	2,030	23,136	35,091
2020	7,625	2,300	2,050	24,846	36,821
2025	7,625	2,300	2,050	26,625	38,600

*Note : MWD-MAIN calibrated for Glendale were used in projections*

The major increase in San Fernando Basin water supplies reflects operation of the Glendale Water Treatment Plant. Based on current demands, this supply would provide for about 23 per cent of the water used in the City.

Current and projected water uses and the number of service connections by categories are shown in Tables II-4 and II-5. A key conclusion is that while water use is expected to increase, the number of metered connections is expected to remain relatively unchanged. The projected

demands on Table II-4 are based on billing availability, not production, which is presented in other sections of this UWMP. The difference between Tables II-3 and II-4 represents unaccounted-for water use.

**TABLE II-4**  
**PROJECTED WATER USE BY CATEGORY (AF)**

	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	<u>2025</u>
Single Family Residential	12,937	13,320	13,527	13,734	13,942	14,150
Multi-Family Residential	12,024	10,958	11,498	12,038	12,578	13,120
Commercial/Institutional	5,314	4,444	4,866	5,288	5,710	6,132
Industrial	696	483	535	587	639	690
Irrigation	501	493	494	496	498	500
<b>TOTAL</b>	31,472	29,698	30,920	32,143	33,367	34,592

**TABLE II-5**  
**PROJECTED NUMBER OF CONNECTIONS PER CUSTOMER TYPE**

	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	<u>2025</u>
Single Family Residential	22,222	21,239	21,494	21,750	22,004	22,260
Multi-Family Residential	6,334	6,136	6,224	6,312	6,400	6,487
Commercial/Institutional	3,245	3,165	3,154	3,144	3,135	3,122
Industrial*	353	179	222	265	308	350
Irrigation*	286	138	175	212	249	285
<b>TOTAL</b>	32,440	30,857	31,269	31,683	32,096	32,504

\* Include recycled water service connections

## G. UNACCOUNTED-FOR WATER

The City of Glendale annually calculates the unaccounted-for water use in the water system. Unaccounted-for water use is one way used to describe the “tightness” of the water distribution system. Generally, unaccounted-for water use is defined as the differences between the amount of water produced and water served. A significant amount or percentage of unaccounted-for water would represent an operating cost or revenue loss to the City. Unaccounted-for water can be the result of system leaks, flushing for water quality purposes, reservoir drainage for repairs or operational spills, street cleaning, sidewalk trees watering, sewer cleaning, meter inaccuracies, meter-reading errors, accounting errors, etc.

There are two basic types of unaccounted-for water:

- Metered or evident uses: These are water used by City departments during daily operations or special incidents and will not be charged for the usage. For example: tank drainage, water quality flushing, street sweeping, hydrant flows, plant watering, etc.
- Unknown or unmetered water uses: These are potential uses the agency is speculating occur but does not have the ability to accurately confirm. These potential uses include fire fighting, unidentified leakage in the system, meter inaccuracies, theft, underestimated accounts, improperly sized and types of meters, and meter reading errors or accounting errors.

For the City of Glendale, the total of unaccounted water use has fluctuated between 7.8 percent and 9 percent over the past few years, as indicated in Table II-6 below. The reason for the change from year to year could relate to the demand conditions and billing cycle issues at the beginning and end of the fiscal year. Factors that also have contributed to the increase are: construction works, storage cleaning, flushing, fire hydrant flow testing, well testing and

rehabilitation, and major main breaks. Generally, system losses are about the same quantity each year, but the percentage of unaccounted water can change with variable sales.

The American Water Works Association states that the unaccounted-for water use should not exceed 10 percent. Based on these criteria, the unaccounted-for water in Glendale system is considered as “acceptable”. Therefore, a leak detection survey is not necessary.

The City has increased its effort in identifying evident-used types of unaccounted-for water by coordinating with other City departments to meter their water usage for daily operations. Private contractors are also required to meter their water use. The Water Department also attempts to minimize “unknown” water uses through a small-meter replacement program to replace meters that tend to under-register over time and large-meter testing and calibration program to assure the ongoing accuracy of the meters.

**TABLE II-6**  
**UNACCOUNTED-FOR WATER**

<u>YEAR</u>	<u>PERCENT</u>	<u>VOLUME (AF)</u>
2000 - 2001	7.8	2,611
2001 - 2002	7.5	2,542
2002 - 2003	9.2	3,065
2003 - 2004	8.5	3,004
2004 - 2005	9.0	2,937

## **H. WATER USE OUTLOOK**

The population growth in the City is expected to be minimal over the next 20 years as the City is essentially built out. Development will likely be infilling of developed areas and higher density development as old single-family homes are demolished and multi-family housing constructed.

With minimal population growth anticipated, there should be an even lower increase in water use as the higher density development results in lower per capita water use. The biggest annual change in water use will be from the varying weather patterns. Compared to normal water demands, water use can decrease by 6 percent in the wetter years and can increase by 6 percent, in hot dry years. For planning purposes the City must be able to meet demands during hot dry years when water demands are high.

### III. WATER SUPPLY

#### A. HISTORY

Near the beginning of the 1900's, a number of private mutual water companies, together with individual producers, supplied the water needs of the emergent population. This was accomplished through the use of local ground water sources, by way of water wells and pumps, within both the San Fernando Basin and Verdugo Canyon. To cope with the growing population and increasing demand, a Water Commission was appointed and recommended the purchase of four large private water companies to establish a municipal water utility. In 1914 the municipal water system began its operation (currently called Glendale *Water & Power*). In the years that followed, other water companies were purchased and added to the water system. As late as 1940, groundwater from the San Fernando and Verdugo Basins were the only sources of water in the City.

With future development dependent upon an adequate water supply, thirteen Southern California cities, including Glendale, agreed to the formation of the Metropolitan Water District of Southern California (MWD), in November 1928, to construct the 242 mile-long Colorado River Aqueduct to import water from the Colorado River. A water delivery system was likewise constructed to deliver the water to the 13 member cities in the coastal areas of Southern California. Construction started in early 1933, and the initial facility was completed in 1941. Glendale first drew upon its MWD source in mid 1946.

In the late 1950's, it became apparent that the Colorado River water supply would not be sufficient to supply the ever-increasing demand with significant population growth and other communities annexing to MWD. In 1960, California voters approved the issuance of a general bond to build the initial features of the State Water Project. The California Aqueduct System was constructed to transfer surplus water from Northern California to the semi-arid central and southern region of the state. MWD contracted for significant amounts of water to be

delivered by the State Water Project and began delivering this water to its member agencies in 1972.

The production from the San Fernando Basin in the 1960's reached a peak of about 17,000 acre-feet per year (AFY). The Grandview well water collection system in the San Fernando Basin operated with a peak capacity of about 24,000 gpm (34.6 million gallons per day-MGD) into the potable water system.

In mid-1970's, the City's production was limited from the San Fernando Basin to about 12,000 AFY as part of a court decree arising from a lawsuit by the City of Los Angeles, City of Los Angeles vs. the City of San Fernando. In 1975, the California Supreme Court decision in the Los Angeles suit further limited the City's production right.

In late 1979, Assembly Bill 1803 required that all water agencies using ground water must conduct tests for the presence of certain industrial solvents. These tests indicated that "volatile organic compounds" (VOC's) such as trichloroethylene (TCE) and perchloroethylene (PCE) were present in the San Fernando Basin groundwater supplies in concentrations exceeding State Department of Health Service maximum contaminant levels (MCL). Both chemicals were used extensively in the past in manufacturing and dry-cleaning. At that time, the hazards to the water supplies were not known. As a result, Glendale, along with other communities in the San Fernando Valley, had to further limit its use of San Fernando Basin supplies. The City almost totally suspended production from the basin because of the difficulty of producing supplies meeting the MCL's for the VOC's. Prior to 2003, except for a small quantity (about 400 AFY) used at the Glendale Power Plant for cooling tower make-up water and irrigation at Forest Lawn Memorial Park, no water from the San Fernando Basin was being used in Glendale.

The water quality and water rights problems in the San Fernando area severely impacted the ability of the City to produce water from the Basin and made the City even more dependent on

MWD water supplies. In the 1980's, the U.S. Environmental Protection Agency (EPA) designated the San Fernando Basin as a Superfund site. This resulted in the construction of the Glendale Operable Unit consisting of a water treatment plant and eight (8) wells. In the summer of 2000, the use of San Fernando Basin groundwater was restored.

Other limitations to ground water use occurred in the late 1970's when production from the Verdugo Pick-up System in the Verdugo Basin was discontinued because of possible water quality problems.

Due to the increase in population, economic growth, decrease in availability of local water supply, water quality problems and diminished water rights, Glendale's dependency on imported water from MWD increased to more than 90 percent of the total potable water need.

In the late 1970's, the City began delivering recycled water from the Los Angeles- Glendale Water Treatment Plant for irrigation purposes and for use in the cooling towers at the Glendale Power Plant. Expansion of the recycled water system, beginning in the early 1990's, greatly increased recycled water use.

## **B. CURRENT WATER SUPPLY SYSTEM**

The City of Glendale currently has four sources of water available to meet demands. Each of these sources, as well as the quality of water available, with respect to the source, is described below. The entry points in the Glendale water system for the various supplies are shown in Figure 7. The location of the "out of the area" water sources is shown in Figure 8. Over the past 5 years, there has been a change in the mix of supplies used to meet water demands in the City. In the future, we project minor changes in water supplies. These changes and sources are discussed below.

## 1. San Fernando Basin

The City's water right to San Fernando Basin supplies is defined by the judgment (see Appendix D) entitled "The City of Los Angeles vs. the City of San Fernando, et al." (1979). It consists of a return flow credit, a type of water right based on the assumption that a percentage of water used in the City is returned to the groundwater basin. Additionally, the City has a right to accumulate its credits annually if its water rights are not used. In the water year 2003-04, the City has a storage credit of 75,920 AF within the basin. This represents water that the City was unable to pump from the basin because of water quality problems. Also, there is a right to produce excess water subject to a payment obligation to the City of Los Angeles based primarily on the cost of MWD alternative supplies. This right to produce water in excess of the return flow credit and the accumulated credits are significant factors in relation to the source of water to be used at the Glendale Water Treatment Plant (GWTP), which is part of a U.S. Environmental Protection Agency (EPA) Superfund clean-up project in Glendale. The project consists of a 5,000 gallon-per-minute (gpm) facility and eight wells that supply the plant. The project currently delivers approximately 7,200 AFY to the City and provides about 23 percent of the City's total demand. Further discussion of this can be found later in this report. The various San Fernando Basin supplies are:

Return Flow Credit – Glendale is entitled to a return flow credit of 20 percent of all delivered water (including recycled water) in the San Fernando Basin and its tributary hill and mountain area. It is calculated by determining the amount of total water used in the City less 105 percent of total sales by Glendale to Verdugo Basin and its tributary hills. This credit ranges from about 5,000 AFY to 5,400 AFY depending on actual water use. This is the City's primary water right in the San Fernando Basin.

Physical Solution Water – Glendale has an agreement to extract excess water chargeable against the rights of the City of Los Angeles upon payment of specified charges generally tied to MWD's water rates. Glendale's physical solution right is 5,000 AFY.

Pumping for Groundwater Cleanup – Section 2.5 of the Upper Los Angeles River Area's Policies and Procedures, dated July, 1993, provides for the unlimited extraction of basin water for SUPERFUND activities, subject to payment of specified charges similar to physical solution water. This right became a significant factor with the completion of the Glendale Water Treatment Plant (GWTP) in 2000.

Carry-over extractions – In addition to current extractions of return flow water and stored water, Glendale may, in any one year, extract from the San Fernando Basin an amount not to exceed 10 percent of its last annual credit for import return water, subject to an obligation to replace such over-extraction by reduced extraction during the next water year. This provides an important year-to-year flexibility in meeting water demands.

For the San Fernando Basin, the rights described above give the City the right to extract from a practical point of view, subject to certain conditions and payment in some cases, any quantity of water anticipated to be needed for the City's future water resource program. Each water right used to produce from the San Fernando Basin has its own costs and availability considerations.

## **2. Verdugo Basin**

Historically, groundwater supplies from the Verdugo Basin contributed a portion to the City's water supplies. This has been from wells and an underground water infiltration system. The Judgment in the Los Angeles lawsuit gave Glendale the right to extract 3,856 AFY from the Verdugo Basin. Crescenta Valley Water District also has water rights and is the only other entity allowed to extract water from the Verdugo Basin.

Use of these supplies has been limited over the past five years because of water quality problems, water levels, and limited extraction capacity. In order to increase the use of these supplies, the City completed construction of the Verdugo Park Water Treatment Plant

(VPWTP) in 1996. This facility has a capacity of 1,150 gpm and treats water from the two low capacity wells (referred to as Glorietta Wells A & B) and from the water supplies in the old Verdugo Pickup, horizontal infiltration system. Actual flows from these sources range between 500-550 gpm. The three existing wells referred to as Glorietta Wells 3, 4, and 6 (entry points B and C) and the Verdugo Park Water Treatment Plant (entry point G) alone will not utilize the City's entire water rights to the Verdugo Basin supplies and additional extraction capacity in the Verdugo Basin will be required to reach the water right capacity. The existing wells and VPWTP produce about 887 AFY. The City has hired a consulting firm to determine possible sites for additional water extraction from the basin. Being an urban area, there are many issues surrounding finding a desirable well site. If the City were able to utilize its full rights to these supplies, about 12 percent of the demands could be obtained from this Basin.

### **3. Metropolitan Water District**

The Metropolitan Water District of Southern California (MWD) is a public agency organized in 1928 by a vote of the electorates of 13 Southern California cities which included Glendale. The first function of MWD was building the Colorado River Aqueduct to import water from the Colorado River. Water deliveries through the aqueduct began in the early 1940's. This imported water supplemented the local water supplies of the original 13 Southern California member cities. In 1972, to meet growing water demands in its service area, MWD started receiving additional water supplies from the State Water Project. The State Water Project is owned and operated by the State of California Department of Water Resources (DWR). MWD currently imports water from these two sources: (1) the Colorado River via the Colorado River Aqueduct and (2) the State Water Project via the California Aqueduct.

The locations of the above facilities are shown in Figure 9. MWD's service area includes the Southern California coastal plain. It extends about 200 miles along the Pacific Ocean from the city of Oxnard on the north, to the Mexican boarder on the south, and it reaches 70 miles inland from the coast. MWD is currently composed of 27 member agencies, including 14 cities, 12 municipal water districts, and one county water authority.

### **3a. Colorado River Water**

The Colorado River Aqueduct conveys water 242 miles from the W.P. Whisett Pumping Plant Intake Facility at Lake Havasu, on the Colorado River, to its point of termination at Lake Matthews Reservoir, near the city of Riverside. From this reservoir, water is distributed to its 27 Member agencies throughout Southern California.

California is one of 7 states that have rights to divert water from the Colorado River. MWD is one of 6 California entities that have rights to Colorado River water. Most of this water is used for irrigating agriculture in the Imperial Valley. California has a right to the Colorado River at 4.4 million acre-feet per year. MWD's basic right to California's share of Colorado River Water is 550,000 acre-feet per year. Historically, California has been using about 5.3 million acre-feet per year of water. Additional water has been used primarily by MWD. This has always been a concern to the other states that have rights to Colorado River water. Since MWD has the least right to Colorado River water and the concerns by other Colorado River Basin States, efforts are underway to reduce California's use of its right to 4.4 million acre-feet per year. A variety of programs have been designed to increase conservation of water supplies and storage supplies while still keeping the Colorado River Aqueduct full. Some of the programs are listed below. Detailed information on these many programs is provided in MWD's Regional Urban Water Management Plan.

- **Diamond Valley Lake** – the completion of Diamond Valley Lake nearly doubled the area's surface water storage capacity;
- **Groundwater Storage Program in Upper Coachella Valley;**
- **Water Conservation Program in the Imperial Valley** to improve irrigation efficiency in return for the right to divert the water conserved by the programs;

- **Test Land Fallowing in the Palos Verde Valley;**
- **Demonstration Groundwater Storage Program in Central Arizona;**
- **Imperial Irrigation District - San Diego County Water Authority Transfer and Metropolitan - San Diego County Water Authority Exchange;**
- **All American Canal and Coachella Canal Lining.**

### **3b. State Water Project**

The second source of imported water for MWD is the State Water Project (SWP), which is owned by the California Department of Water Resources (DWR). SWP facilities comprise 32 storage facilities (reservoirs and lakes), 662 miles of aqueduct, and 25 power and pumping plants. The SWP originates at Lake Oroville, which is located on the Feather River in Northern California. That water, along with all additional unused water from the watershed flows into Sacramento/San Joaquin Delta. Water from the Delta is then either pumped to water users in the San Francisco Bay area or transported through the California Aqueduct to water users in Central and Southern California.

DWR contracted to deliver water in stages to 29 SWP contractors, with an ultimate delivery of 4.23 million AF per year. Currently, DWR is delivering water to 29 SWP contractors. MWD is the largest, with a contracted entitlement of 2,011,500 AF per year, or approximately 48 percent of the total contracted entitlement. MWD receives deliveries of SWP supplies via the California Aqueduct at Castaic Lake in Los Angeles County, Devil Canyon Afterbay in San Bernardino County, and Box Springs Turnout and Lake Perris in Riverside County. The first delivery of SWP water to Metropolitan occurred in 1972.

The initial facilities of the SWP, completed in the early 1970's, were designed to meet the early needs of the SWP contractors. It was intended that additional SWP facilities, including water supply facilities, would be built over time to meet projected increases in contractors' delivery needs. Each contractor's SWP contract provided for a buildup in entitlement over time, with most contractors reaching their maximum annual entitlement by the year 1990. Since the completion of the initial SWP facilities in the early 1970's, no major water supply improvements have been added to the project.

This is primarily due to environmental issues in the Bay-Delta, which have limited the ability to pass water from Northern California through the Bay-Delta to the southern part of the state. CalFed, an association of State and federal agencies, has been assigned the task of balancing the competing needs and developing options to provide a long-term solution to the Bay-Delta Program and pledges to restore the Bay-Delta ecosystem, improve water quality, enhance water supply reliability and assure long-term stability for agriculture, urban and environmental uses. The plan promises benefits to the environment, California's economy, and to urban and agricultural users.

CalFed recently released a report on a long-term plan that outlines necessary actions to accomplish program goals, and is expected to include projects that provide additional water supply reliability to MWD and to its member agencies like Glendale.

MWD has initiated many programs to improve the reliability of the State Water Project supplies outside of the CalFed process. Some are:

- **Semitropic Water Storage Desert Agreement** to store SWP supplies in Semitropic groundwater basin. This water is stored during times of surplus and withdrawn during times of drought in the MWD service area.
- **Arvin Edison Water Management Program** operates similar to the Semitropic Program.

To date, MWD has stored significant quantities of water in these San Joaquin Valley groundwater basins storage projects, with more intended.

### 3c. Glendale-MWD Delivery Points

Glendale receives MWD water through three service connections shown as entry points D, E & F on Figure 7. The service connection number and capacity are summarized in Table III-1 below. In total, MWD has a total delivery capacity of 70 cubic feet-per-second (cfs). During hot summer days, it is common for Glendale to utilize the full capacity of the facilities. Any significant increase in demands on MWD could require another service connection.

TABLE III-1	
METROPOLITAN CONNECTIONS AND CAPACITY	
<u>Service Connection</u>	
<u>Number</u>	<u>Capacity (cfs)</u>
G-1	48
G-2	10
G-3	12*

\* To increase to 20 cfs by mid 2006

Over the years, MWD has provided high level of reliability in meeting Glendale's supplemental water supply needs. It is believed that the reliability of water supply to the City will continue in the future as a result of the many water resource programs under way and the proposed future programs now being considered based on their Water Surplus and Drought Management (WSDM) Plan and Integrated Resources Plan (IRP). This source will always be a major factor in meeting the water needs of the City. The City closely follows the planning activities at MWD to assure they have adequate supplies to meet the needs of their member agencies.

#### 4. Recycled Water

Information on Glendale's recycled water activities is provided in Chapter V.

#### 5. Summary of Local Supplies

The current use of local resources available to the City is substantially less than rights primarily because of water quality and extraction problems (discussed later herein). A general summary of the City's rights to local water resources compared to the amount currently being used is shown on Table III-2.

TABLE III-2 LOCAL WATER PROJECTS AND USE (AFY)			
<u>Potential</u> <u>Source</u>	<u>Right</u>	<u>Current Use</u>	<u>Future Use</u>
San Fernando Basin	5,000 - 5,400	400 AFY	7,600
Verdugo Basin	3,856	2,200 AFY	2,300
Recycled Water	10,000	1,500 AFY	2,050

*Note : Include Glendale Physical Solution Water Right and Use*

### C. SYSTEM IMPROVEMENTS

#### 1. Glendale Water Treatment Plant

The City has continued to expand the use of its local water supplies with the addition of the Glendale Water Treatment Plant (GWTP). The GWTP, which began delivering water to the community in the middle of 2000, has been operating at full capacity despite issues related to chromium-6 and has yielded an average production rate of 7 MGD.

## 2. Chevy Chase 968 Reservoir Project

In 1997 during a routine inspection of the reservoir, City staff observed cracks in the column foundation which were believed to be the result of the 1994 Northridge earthquake. Temporary repairs have been done and, if continued, will be costly. It became apparent the most cost-effective solution is to replace the entire reservoir in a relatively short time.

The project is divided into three major tasks:

- (1) Developing potential alternative sites (2004-2005) – Alternatives have been presented to the community and golf course owners. Site selection was finalized in Spring of 2005 and environmental documentation is being prepared.
- (2) Environmental impact analysis, engineering design, and soil analyses (2005-2006) – After the site selection, final design, detailed soil analysis, structural engineering, hydraulic analysis and cost estimate will be performed and presented to the community.
- (3) Construction of the reservoir (2006-2009) – The construction of the new 15-million gallon reservoir is projected to begin in 2006 and be completed by 2009.

Glendale *Water and Power* will be working closely with the Fire and Police Departments to ensure that any emergency services are readily available throughout all phases of the project.

## 3. Water Main Replacement Program

Another program to improve the water system is the Water Main Replacement. Work completed in the last 5 years is listed below:

**Hillcrest (FY 2003-04 Project I)** – Installation of 1.3 miles of new 8" water main, replacing old 4" main.

**Cascadia (FY 2003-04 Project II)** - Installation of over 1.2 miles of new 8" water main, replacing old 4" main.

**Rossmoyne/Adams Hill (FY 2003-04 Project III)** - Installation of over 1.3 miles of new 8" water main, replacing old 4" main.

**Rossmoyne (FY 2004-05 Project I)** - Installation of 1.6 miles of new 8" water main including 14 new fire hydrants.

**Moncado (FY 2004-05 Project II)** - Installation of 1.7 miles of new 8" water main.

**Irving (FY 2004-05 Project III)** - Installation of 0.8 miles of new 8" water main.

In Fiscal Years 2003-04 and 2004-05, about 3.8 miles and 4.1 miles of 4" mains, respectively, have been replaced including new service connections and additional fire hydrants.

#### **4. Water Main Cleaning and Lining Program**

Water main cleaning and lining has been on going for more than 10 years. The Department has a standing policy that the minimum size of distribution lines in the system is 8 inches. Smaller sizes have been replaced to increase capacity to meet the increasing demand for water. See Figure 10 showing details of both programs. Works completed in the last 5 years are:

1. Sunset Road (and nearby streets) - Completed in January 2004
2. Doran Street - Completed in May 2005
3. Chevy Chase Canyon Drive - Completed in June 2004

#### **5. Pumping Stations Improvement Program**

The Department has continuously rehabilitated or replaced inefficient pumps and motors at all

our pumping stations. The priority needs have been established and the following works completed have been the most recent:

1. Western Pumping Station – Installation of new motors
2. Park Manor Pumping Stations – New boosters, electric motors and starter installed
3. Glorietta Park Pump Station – Completed the design of new switchgear and motor control starters, installed new pumps and motor
4. Melwood Pumping Station – New motor
5. Emerald Isle 1666 PS – New end suction pump
6. Glorietta Well No. 3 – New motor and pump
7. Glenoaks 968 PS – New pump installed
8. Grandview Pumping Station – Large compressor, rebuilt pump and motor, new clay valve installed
9. Markridge PS – New pump and two motors
10. Verdugo 1&2 – Rebuilt pump and motor
11. Metro 1 – Rebuilt pump and motor
12. Metro 2 – Repair turbine meter and installed new butterfly valve

## **6. Installation of Pressure Reducing Stations**

In an effort to enhance reliability, the Water Department has installed several Pressure Reducing Valve (PRV) Stations throughout the distribution system. These new stations offer the system a much greater degree of redundancy during high demand periods as well as make it easier to take reservoirs out of service for maintenance purposes.

## **7. Groundwater Extraction Facility Replacement**

The Glendale *Water & Power* Department is in process of siting, drilling and equipping a replacement well in the Verdugo Basin. The existing wells are not producing the expected

production in spite of rehabilitation work which was completed in 2004-05. A decrease in the groundwater production has been noted in recent years and a new well will be the best alternative. The new well will reduce the City's dependency on MWD water.

#### **8. Water System Analysis (Hydraulic Modeling)**

In May of 2005, the City of Glendale employed the services of Carollo Engineers to begin Phase I of the City's Water Hydraulic Model Development Program. It is expected to be completed by 2006. The objectives are to continue the analysis including water flows, pressure, etc. This will give a better understanding of the system and optimized operation. It will help to determine areas with water quality problem, assess causes of service interruptions, and assist in meeting new regulations such as the Disinfection By-product Rule (DBPR).

#### **9. Water Supervisory Control & Data Acquisition System (SCADA) Upgrade**

In October of 2003, the City began a program to upgrade its Supervisory Control And Data Acquisition System (SCADA). The work included the replacement of 16 Programmable Logic Controllers (PLC's) as well as Radio Transmission System upgrades for many of the City's Water Pumping Facilities. The work to upgrade the SCADA system at the remaining pump stations is ongoing and is scheduled for completion within the next year.

#### **10. Metropolitan Water District G-03 Service Connection Upgrade**

A contract between the City and MWD has been signed to increase the delivery capacity from 12 cfs to 20 cfs of their G-03 service connection to the Glendale's water system. This will improve the blending capability and reliability of the MWD supply.

## **11. Future L.A. Interconnections**

Glendale is working with City of Los Angeles, Department of Water and Power to establish two (2) interconnections between the two systems. These will increase Glendale's reliability by providing an emergency source of supply.

## **D. FUTURE GOALS**

### **1. Future Water Supplies**

The City expanded the use of its local water supplies with operation of the Glendale Water Treatment Plant (GWTP). However, because of the chromium-6 related issues, the reliability of this water supply cannot be guaranteed into the future until a chromium-removal treatment is put into operation. Glendale is working with the cities of Los Angeles and Burbank, with the help of EPA and American WaterWorks Research Foundation (AwwaRF), to develop a new treatment technology for chromium-6. The plan is to have a complete treatment facility in place by the year 2008. Currently, 70 percent of the water used in the City is provided by MWD. The Water Department is planning to increase water production in the Verdugo Basin by constructing a new well within the basin and increase the recycled water use by adding small users and expand the marketing effort to neighboring agencies. The Glendale Water Department goal is to reduce the City's water purchase from MWD to 65% of total water use by the year 2010.

The increased development of our local water sources will firm up water supplies available to the City as the local water supplies are expected to be available during wet or dry years and even in times of extended drought. The imported supplies from Northern California and, to a lesser extent, the Colorado River may be affected during drought years. The MWD's new Diamond Valley Reservoir also improves MWD's overall water reliability to provide all the water Glendale needs even during dry periods.

A summary of Glendale's projected 20-year water needs for normal and dry conditions are provided in Table III-3, showing the changes in water sources over the next 20 years (Figure 11). Water supplies are expected to meet water demands on a very reliable basis. The "dry year" demand is assumed to be 6 percent higher than the "normal demand" based on experience in the City. A key conclusion from Table III-3 is that higher demands in the City will be met by increased purchases from MWD. The City is actively working with MWD to assure there are adequate future supplies.

TABLE III - 3  
GLENDALE'S WATER DEMANDS AND SOURCES OF SUPPLY  
TO MEET DEMANDS DURING NORMAL AND DRY YEARS  
(ACRE-FEET)

	<i>Normal Year</i>					<i>Dry Year</i>				
<i>SOURCE</i>	2005*	2010	2015	2020	2025	2005	2010	2015	2020	2025
San Fernando Wells	6,466	7,625	7,625	7,625	7,625	6,854	7,625	7,625	7,625	7,625
Verdugo Wells	2,208	2,450	2,450	2,450	2,450	2,340	2,450	2,450	2,450	2,450
Metropolitan Water District	22,666	21,739	22,986	24,696	26,975	24,027	23,768	25,091	26,905	28,791
Recycled Water	1,298	2,010	2,030	2,050	2,050	1,375	2,010	2,030	2,050	2,050
Total Projected Demand	<b>32,638</b>	<b>33,824</b>	<b>35,091</b>	<b>36,821</b>	<b>38,600</b>	<b>34,596</b>	<b>35,853</b>	<b>37,196</b>	<b>39,030</b>	<b>40,916</b>

\* MWD usage increased and recycled water use declined due to construction at LAGWRP and plant shut-downs.

This same information is graphically presented on Figure 11. The key conclusion is that an average of 22 percent of the City's current water supplies is from the San Fernando Valley wells and treatment plant. If this local supply cannot be used, the need for MWD water will be 88 percent. It will be even more during dry years. The current and year 2025 sources of

supply to meet demands are presented in Figure 12. Reduction in MWD water depends on the increase in Verdugo Basin extraction upon completion of a new well.

## **2. Water Reliability Issues**

Reliability of water supplies is a key item for review in this document. The MWD - RUWMP provides significant information on providing a reliable supply of water to its member agencies such as Glendale. The MWD's Water Surplus and Drought Management (WSDM) Plan is the key document in their effort to do so. For Glendale, MWD is the supplier of "last resort" in meeting the needs of our citizens. For this reason, the WSDM Plan is summarized below.

In April of 1999, Metropolitan's Board of Directors adopted the WSDM Plan. This plan guides management of regional water supplies to achieve the reliability goals of Southern California's Integrated Resources Plan (IRP). Through effective management of its water supply, Metropolitan fully expects to be 100 percent reliable in meeting all non-interruptible demands throughout the next ten years. After 10 years, reliability maintenance efforts will require additional water resource programs, which are explained in this report.

Unlike Metropolitan's previous shortage management plans, the WSDM Plan recognizes the link between surpluses and shortages, and it integrates planned operational activities with respect to both conditions. The WSDM Plan continues Metropolitan's commitment to the regional planning approaches initiated in the IRP.

The guiding principle of the WSDM Plan is to manage Metropolitan's water resources and management programs to minimize adverse impacts of water shortages to retail customers. From this guiding principle, the following supporting principles have been developed.

- Encourage efficient water use and economical local resource programs,

- Coordinate operations with member agencies to make as much surplus water as possible available for use in dry years,
- Pursue innovative transfer and banking programs to secure more imported water for use in dry years,
- Increase public awareness about water supply issues.

The WSDM Plan also declared that, should mandatory imported water allocations be necessary, those allocations would be calculated on the basis of need, as opposed to any type of historical purchases. The WSDM Plan contains the following considerations that would go into an allocation of imported water:

- Impact on retail consumers and regional economy,
- Investments in local resources, including recycling and conservation,
- Population growth,
- Changes and/or losses in local supplies,
- Participation in Metropolitan's Non-firm (interruptible) programs,
- Investment in Metropolitan's facilities.

The WSDM Plan also defines five surplus management stages and seven shortage management stages to guide resource management activities. These stages are not defined merely by shortfalls in imported water supply, but also by the water balances in Metropolitan's storage programs. Thus, a ten percent shortfall in imported supplies could be a stage one shortage if storage levels are high. If storage levels are already depleted, the same shortfall in imported supplies could potentially be defined as a more severe shortage. Each year, Metropolitan evaluates the level of supplies available and existing levels of water in storage to determine the appropriate management stage for that year.

When MWD must make net withdrawals from storage to meet demands, it is considered to be in a shortage condition. Under most of these stages, it is still able to meet all end-use

demands for water. The following summaries describe water management actions to be taken under each of the seven shortage stages.

Shortage Stage 1. Metropolitan may make withdrawals from Diamond Valley Lake.

Shortage Stage 2. Metropolitan will continue Shortage Stage 1 actions and may draw from Semi tropic and Arvin-Edison groundwater storage.

Shortage Stage 3. Metropolitan will continue Shortage Stage 2 actions and may curtail or temporarily suspend deliveries to Long Term Seasonal and Replenishment Programs in accordance with their discounted rates.

Shortage Stage 4. Metropolitan will continue Shortage Stage 3 actions and may draw water from conjunctive use groundwater storage (i.e. the North Las Posas program) and the SWP terminal reservoirs.

Shortage Stage 5. Metropolitan will continue Shortage Stage 4 actions. Metropolitan's Board of Directors may call for extraordinary conservation or market open water procedures and curtail Interim Agricultural Water Program deliveries in accordance with their discounted rates. In the event of a call for extraordinary conservation, Metropolitan's Drought Program Officer will coordinate public information activities with member agencies and monitor the effectiveness of ongoing conservation programs.

Shortage Stage 6. Metropolitan will continue shortage 5 actions and may exercise water supply option contracts and/or buy water on the market either for consumptive use or for delivery to regional storage facilities.

Shortage Stage 7. Metropolitan will continue delivering to regional storage facilities, maintain extraordinary conservation effort and develop a plan to allocate available supply fairly and efficiently to full-service customers. Metropolitan will enforce these allocations using rate

surcharges (\$175/AF exceeding a member agency's allotment). If it exceeds 102 %, surcharge will be equal to 3 times MWD full service charge.

As one can see, there are significant planning efforts to minimize the impacts of a drought condition. If these MWD resources fail to provide needed supplies, the City will be requested to implement its Mandatory Conservation Plan, as discussed later in this report.

### **3. Transfer and Exchange Opportunities**

Glendale's water system is also interconnected with the City of Burbank and Crescenta Valley Water District for short-term/emergency water service (Figure 8). When the need arises, these connections can be opened to deliver water into the Glendale distribution system to supplement demands and vice-versa. These should be viewed as only short-term transfer of water.

For the long term, MWD is engaged in "out-of-area" dry transfer and exchanges to improve local water supply reliability. It is discussed in MWD's Urban Water Management Plan and is summarized in Chapter 3, Section B-3 Metropolitan Water District. Glendale does not have the basic capability to implement these types of programs. We rely on MWD to perform these activities.

The inter-tie with Crescenta Valley Water District was recently completed. The preliminary design for an interconnection with Los Angeles has begun. Construction is expected to be completed by 2009. This schedule is mainly based on the approval of FEMA funding.

### **4. Inconsistent Water Sources**

The Verdugo Park Water Treatment Plant water supply depends considerably on rainfall because the primary supply is from two shallow wells (Wells A & B). If water levels are low,

there could be an impact on productivity. Currently, Glendale is not maximizing its water rights from the Verdugo Basin water supplies. Additional extraction facilities are anticipated in the future with the objective of developing groundwater resources to utilize the City's rights for these resources. The City has retained services of a consultant to look into the construction of additional extraction wells in the area so that the City can utilize its full water rights even in times of drought. The location of future wells is under review.

## 5. Three-Year Minimum Water Supply

Based on normal demands during the drought years, the minimum three-year water supply is shown on Table III-4. The quantities of water from the various sources and demands are expected to be the same during such a three-year period. If there is a need for significant demand reduction efforts, various voluntary or mandatory conservation efforts can be implemented. Additional water supplies from MWD are essential during drought years. These numbers could change depending on the severity of supply deficiency. A demand of 32,850AF is assumed to be the normal water demand.

**TABLE III-4**  
**THREE YEAR ESTIMATED MINIMUM WATER SUPPLY**  
**ACRE-FOOT**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>
San Fernando Basin	8,056	8,056	8,056
Verdugo Basin	2,438	2,438	2,438
MWD	<u>22,790</u>	<u>22,790</u>	<u>22,790</u>
<b>Total (Supply)</b>	<b>34,821</b>	<b>34,821</b>	<b>34,821</b>

Water supplies from the San Fernando, Verdugo Basin, and recycled water should be unaffected by the drought conditions. If there is a shortage in water supply from MWD, Glendale distribution system could be affected. MWD's completion of the Diamond Valley Reservoir near Hemet added to the reliability of MWD supplies. This reservoir plus other out of the area storage operations should be able to meet demands on a reliable basis over the next 10 years. Also, MWD is proposing contracts with its member agencies to supply water. These contracts will define, by contract, MWD's obligation to provide firm water to the City. It is anticipated that during any three-year drought, Glendale should have a sufficient supply to meet demands. In fact, Glendale will be using less MWD water supplies in the future compared to current use. With Glendale's reduction of dependency on vulnerable imported water supplies, there should be a higher level of reliability of supplies to meet demands.

## 6. Demand Reduction Measures

Should it become necessary to achieve a 50 percent reduction in water use, below are some of the potential methods for reduction in use. The City's Water Conservation Plan specifies the reduction along with some prohibited uses. It is envisioned, based on past experience, that should a reduction be required the City could implement a number of programs identified in Table III-5.

**TABLE III-5**  
**CONSUMPTION REDUCTION METHODS**

Restrict Building Permits  
Use prohibitions  
Water shortage pricing  
Plumbing fixture replacement  
Voluntary and mandatory rationing  
Incentive to reduce consumption

Education program
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## 7. Desalination

Desalination process has been considered but found to be economically inefficient based on the City's distance from the ocean. The process involving converting salt water to drinking water, usually through *reverse osmosis method*, is very costly. Although City of Glendale is currently not using desalination, the City supports MWD and other agencies in the efforts of developing the use and technology of desalination, which increases reliability of the regional water system.

## IV. WATER QUALITY ISSUES

### A. BACKGROUND

In the early 80's, EPA has focused on the construction of clean-up facilities in Glendale. The Glendale Water Treatment Plant and eight extraction wells were constructed to pump, treat and deliver the water to the City via the Grandview Pumping Station. They are designed to remove the volatile organic compounds (VOC) from the contaminated ground water supply and deliver treated water to the potable water supply system.

The clean-up facilities include seven shallow extraction wells and one deep well, a 5,000 gpm water treatment plant, piping to convey the groundwater from the wells to the water treatment plant, a conveyance system to bring water from the Glendale Water Treatment Plant to Grandview facility for chloramination, boosting and blending. It has a capacity of 5,000 gallons per day. A general layout of these facilities is shown on Figure 13.

Major agreements between Glendale, Glendale Respondents Group (GRG), and the EPA were made. The GRG retained CDM Consulting Engineers Inc. (also design and construct) to operate the required facilities. The State DOHS issued a permit to operate the facilities in July 2000. The City started receiving small quantities of water on July 23, 2001. Delivery of the water to the system was initially limited because of the City's reservations to take water with chromium-6 levels greater than the public health goal even though it met the MCL. Of the eight wells, three have levels of chromium-6 over 30 ppb and five have relatively low levels.

With the approval of EPA, operations of the individual wells have been modified to minimize pumping from the high chromium-6 wells and maximize production from the low chromium-6 ones. This local source will provide about 7,200 AFY to the City and will meet about 22 percent of projected near-term water demands.

To date, water produced by the GWTP has met all water quality requirements including primary and secondary drinking water quality standards since the start-up of the facilities.

## **B. VOLATILE ORGANIC COMPOUND (VOC's)**

Tests conducted in the early 1980's indicated the presence of volatile organic compounds in the San Fernando Basin. Two of the most prevalent VOCs are trichloroethane (TCE) and tetrachloroethane (PCE). These industrial solvents and degreasers, used by industries for decades, have found their way into the groundwater supplies. Measured concentration of TCE and PCE exceed 2000 microgram per liter ( $\mu\text{g/L}$ ) in the northwest portion of the City. Detection ranging from 100 to 1,000  $\mu\text{g/L}$  has occurred in several of the monitoring wells in the southwestern portion of the study area. Data collected suggest that TCE and PCE concentration has reached its maximum level at most sampling level base on the EPA monitoring well data. Based on this, the basin was designated as a Superfund site and considered by the California Department of Health Services Division of Drinking Water and Environmental Management to be an extremely impaired source.

A review of the VOC concentrations over time indicates that levels from the past sources have generally stabilized or are declining. Other constituents that were found are 1,1-DCE, 1,1-DCA and cis 1,2-DCE with patterns similar to that of TCE and PCE. The highest detected levels of these constituents are also found in the northwest portion of the study area. However, concentration of vinyl chloride, 1,1,2,2-PCA, 1,2-DCA and carbon tetrachloride occurrence appears to be much less and concentrations rarely exceed 25 microgram per liter ( $\mu\text{g/L}$ ). Except for vinyl chloride occurring near the center of the Glendale South Operable Units (OU), distribution is also similar to that of TCE and PCE.

The final constituent found was benzene measured ranging from less than 10  $\mu\text{g/L}$  to 100  $\mu\text{g/L}$  and detections are much localized. Unlike the other constituents, the highest measurement of benzene occurs in the northern portion of the South OU.

In the last three years of plant operation, further decline in the levels of TCE at GN-3 & GS-1 and increase at GS-2 were noted. On the other hand, increasing levels of PCE have been observed in two of the north and two of the south extraction wells (GS-1 & GS-2 and GN-1 & GN-2) (See Figures 14, 15, 16 & 17).

### C. CHROMIUM-6

After the completion of the \$26 million water treatment plant (as part of the EPA Superfund agreement to clean the aquifer), the City Council halted the start of its operation due to: (1) concern about the levels of chromium-6 (Cr6) in the San Fernando basin aquifer exceeding the public health goal of 2.5 ppb (a non-mandatory standard); (2) concern that treated water from the plant will contain higher chromium-6 levels compared to the current water being delivered to customers; (3) the fact that chromium-6 health effects were not well known. The current MCL is 50 ppb. Expected levels of total chromium-6 in the treatment plant effluent from all eight (8) wells vary from 7 to 14 ppb and blending with MWD water further reduce it from 4 to 6 ppb, still far below any current applicable maximum contaminant level.

The 2.5 pHg has been withdrawn. Legislation has called for establishment of an MCL for chromium-6. The Federal National Toxicology Program has been conducting studies on the health effects of chromium-6 in the water supplies that are expected to be completed by the end 2005.

Recent testing had shown increases in chromium-6 levels at GN-2 (Figure 18). This has affected production level and blending. In operating the GOU to meet the Consent Decree objectives of VOC removal, chromium levels have increased. The City has initiated plans to increase blending capacity and develop chromium-6 removal technology.

In partnership with other cities and AwwaRF, an initial bench-scale technical review was conducted. EPA funded the Phase II Pilot Scale study which identified some promising

technologies.

Because of other communities' concerns in the San Fernando Valley and other areas throughout the United States, Glendale developed a comprehensive three-phase effort in determining the best and most viable available treatment technology to remove Cr6. The phases consist of bench-scale, pilot scale, and demonstration scale testing. The final phase will be the construction of a full capacity treatment system of all groundwater depending on feasibility, costs, and development of water quality standard specifically for Chromium-6.

With the initial funding of \$ 400,000, the Bench-scale testing was initiated in 2002. The purpose was to improve the understanding of fundamental chromium-6 chemistry, screening technologies, their ability to treat and remove Cr6 to very low levels, and identify promising technologies for further study at the pilot scale testing level.

The Phase II – Pilot Scale study followed and basic research work was completed in the fall of 2004. It identified several technologies for demonstration-scale testing that will determine the effective final treatment, capital and operational cost, waste handling issues, etc. The Phase III Demonstration study will begin with additional pilot testing at the GS-3 well site.

The 570 gpm scale plant could be constructed at GWTP adjacent to the Utility Operations Center. Depending on the final recommended treatment process, it has an estimated cost of about \$ 2 M dollars.

An advisory committee (PAC) has been created to oversee the study and make recommendations based on the findings. The committee members are representatives from Glendale *Water & Power*, Los Angeles DWP, U.S. EPA and the California Department of Health Services.

**D. PERCHLORATE**

Test results for perchlorate on samples taken in the system were not detected.

**E. BLENDING CAPABILITY**

Due to concern of the increasing levels of certain contaminants in the San Fernando Basin, the City requested MWD to increase the capacity of their service connection to Glendale. It was agreed upon that MWD will be designing and do the work with the cooperation and assistance of the City's field personnel.

This will increase the system's blending capability and additional water supply to the system. This increase in capacity could lower the chromium-6 concentration and improve the overall water system operation capacity. After the design completion by the end of 2005, work is expected to be completed by summer of 2006.

**F. DISINFECTION BYPRODUCT - TTHMs & HAAs**

The City has consistently met the State and Federal MCL for TTHM of 80 ppb, 16 sites are sampled quarterly. Compliance is based on the annual average of the 16 sites. EPA has proposed Stage 2 of the DBPR. It is anticipated that compliance at each site will need to meet the annual average of 80 ppb, instead of averaging all 16 sites.

To identify the sites prone to high DBP & to develop mitigating strategies, City has initiated development of a hydraulic & water quality model. It will also be used to meet the Initial Distribution Evaluation required by Stage 2.

## **G. WATER QUALITY EFFECT ON SOURCES**

### **I. SAN FERNANDO BASIN:**

#### WELLS – Glendale Water Treatment Plant

As has been discussed in the previous sections, the GWTP was originally built to remove the volatile organic compounds in the San Fernando Basin. With the concern of chromium 6, studies are on-going to develop the technology for its removal.<sup>5</sup>

Even if the technology found will not entirely remove chromium 6 in the source water, the blending of MWD water could make its concentration almost negligible. By the end of 2006, the State DOHS could have issued a new standard for Chromium and the City will likely meet the new requirements.

Should the Chromium content and other contaminants increase through time from the basin and blending cannot meet the federal and state requirements, the effect would just be the increase in the use of MWD water. The reliability of MWD source is described in Volume III Attachment B, Section 4.

Currently, if any of the wells in the basin has a substantial increase in chromium levels, the low level wells are used and water from the other well is diverted to the river.

### **II. VERDUGO BASIN**

#### Glorietta Wells

The Glorietta Wells have been the main source of local water from the Verdugo Basin. Historically, a water quality parameter of concern in the basin is the high nitrates from the

septic tanks in the La Crescenta area. Now that the areas are sewered, the nitrate levels are expected to decrease in the future. The water is blended with MWD supplies in one of the City's large storage facilities. The resulting levels do not have any impact in the usability of the groundwater supplies.

PCE has been detected in the Glorietta Wells ranging from 1 to 3 ppb. Levels have been stable over the years and EPA has determined that no remedial action will be required for the Verdugo Basin study area.

### Verdugo Park Water Treatment Plant

In an attempt to utilize the water source from the Verdugo Basin, the plant was built in the early 90's to capture water from existing underground water infiltration pick-up system. Since the expected production is highly variable based significantly on rainfall conditions, two shallow wells were added to deliver water to the system. This source is considered to be under the influence of the surface water for regulatory purposes.

The nitrates levels at the effluent ranges from 2 to 4 ppm as N. The MCL is 10. It is blended with MWD supply to lower the nitrate level and does not pose any major impact on the groundwater supplies.

### **III. Metropolitan Water District**

With MWD as the main source of water supply delivered by the City to its constituents, its reliability both on availability and water quality has always been a concern by Glendale and other member agencies it serves.

Due to degradation of the quality of water in the San Fernando basin in the 90's, the city's dependency on MWD water reached to almost 95%. Glendale can receive water from either of

two of MWD's five treatment plants; Weymouth and Jensen. These plants also have two primary sources of water; Colorado River and the State Water project. With the City's initiative to reduce dependency on MWD supply, recent developments and improvements on local sources have reduced the use of imported water to about 60%.

The reliability and water quality that MWD delivers have been discussed in detail in MWD's Integrated Resources Plan (Volume III Attachment A) and in MWD's Urban Water Management Plan.

## **V. RECYCLED WATER ACTIVITIES**

The City of Glendale has been delivering recycled water from the Los Angeles/Glendale Water Reclamation Plant (LAGWRP) since the late 1970's. This is a 20 million gallon-per-day (MGD) facility owned by the Cities of Los Angeles and Glendale. Glendale is entitled to 50% of any effluent produced at the plant. Treated wastewater that is not used in either the Glendale or Los Angeles system is discharged to the Los Angeles River and eventually reaches the ocean.

### **A. WASTEWATER SYSTEM**

#### **1. Wastewater System**

The City owns, operates, and maintains one wastewater pumping station (Doran Street Wastewater Pumping Plant) that lifts sewage from a low point in the collection system to a maintenance hole at a higher elevation. The pumping plant is equipped with four 1,150-gpm, 25-horsepower submersible pumps (one emergency standby) and one 3-horsepower sump pump.

Existing wastewater collection system within Glendale consists of approximately 360 miles of underground wastewater pipelines. These pipelines range from 8 inches to 36 inches in diameter, and approximately 87 percent of them are 8-inches in diameter. Vitrified clay pipes (VCP) are the most commonly used in the wastewater collection system.

#### **2. Wastewater Generation and Collection**

The existing wastewater system collects sewage at its point of origin and conveys wastewater in a southerly and southwesterly direction to the Los Angeles North Outfall Server (NOS), located along the Los Angeles River. Similar to most wastewater systems, Glendale's

collection system uses the natural topography to allow gravity to convey wastewater to its point of final discharge into the NOS. Glendale's topography, in combination with physical configuration of the system, has divided the service area into eight major drainage basins or tributary areas.

Wastewater flows are measured at prescribed locations prior to final discharge. The City, in cooperation with the City of Los Angeles, constructed six flume facilities, one site with in-line telemetering equipment, and installed a flow meter at the pump station to measure the flows.

In addition to the development of the areas associated with these major drainage basins, each basin was further divided into smaller tributary areas or sub-basins. These basins were derived to distribute wastewater flows throughout the system and were based on existing pipeline connectivity, unique demand patterns, isolation of areas with known hydraulic constraints, and integration of facilities downstream of significant dischargers.

Wastewater generated by residents and businesses is collected and conveyed by the City's sewer infrastructure and discharge to either the City of Los Angeles's Hyperion Treatment Plant (LAHTP) or to the Los Angeles-Glendale Water Reclamation Plant (LAGWRP), with the sludge discharged to the Hyperion System.

The LAGWRP treatment consists of a series of processes that successively remove solids until the resulting water meet Title 22 tertiary effluent requirements. Four levels of purification are provided: preliminary, primary, secondary, and tertiary treatment with disinfection.

### **3. Wastewater Disposal**

Most solids are separated from the wastewater during the primary and secondary processes at the LAGWRP. The resulting sludge is returned to the NOS to the Hyperion Treatment Plant. The remaining wastewater is then further treated to eliminate any remaining impurities. Final

product is used in recycled water programs or discharge to the Los Angeles River.

#### 4. Treatment Facilities

The source of recycled water in the City is the Los Angeles/Glendale Water Reclamation Plant located near Colorado Boulevard, and the Los Angeles River, and is owned by the Cities of Los Angeles and Glendale. This facility is part of Los Angeles Hyperion Waste Water system. LAGWRP is what is referred to as a “skimming plant” designed to reduce the flows of raw sewage in the transmission pipelines and also to provide treated wastewater for recycling “inland” purposes. The solids from the treatment process are discharged back into the transmission system and removed at the Hyperion Treatment Plant in El Segundo. LAGWRP has a capacity of about 20 MGD. Treated wastewater is either delivered to the Cities of Los Angeles and Glendale for recycled water use, or discharged to the Los Angeles River. Information on quantities collected and treated at the plant pumped to the Greenbelt system is provided in Table V-1.

**TABLE V-1**  
**WASTE WATER COLLECTED AND TREATED AT LAGWRP**

<u>Year</u>	<u>Volume Collected (AF)</u>	<u>Quantity Treated (AF)</u>
2000	16,041	4,146
2005	17,444	4,447
2010	18,315	4,668
2015	19,230	4,900
2020	20,190	5,147
2025	21,200	5,405

## **B. CURRENT - FUTURE IMPROVEMENTS**

The plant has undergone construction-rehabilitation of the aeration and settling basins to improve its production reliability. A half plant operation started April 11 and ended on August 31 of 2005. During the course of construction period, a two week reduction of production to 4 MGD and several plant shut-downs were experienced. In view of these, improvements of providing alternative water source to customers have been considered for any future recycled water service interruption.

LADWP provided an emergency potable water supply for the Griffith Park Tank for any future system shutdown. We are also considering the installation of swivel-el connection on major recycled water users (mainly for irrigation) to make the supply more reliable and assured. Other ways to provide alternative source of water for emergency use are also being considered.

A study will be done on considering adding a new tank at the Lower Scholl Canyon to increase the storage capability of the system.

## **C. RECYCLED WATER PROJECTS**

The City of Glendale has many recycled water projects designed to serve different parts of the City. Each is reviewed below.

**1. Power Plant Project** - Recycled water deliveries were first made to the Glendale Power Plant for use in the cooling towers and to Caltrans for irrigation along the 134 Freeway near the 5 Freeway in the late 1970's. A pipeline was constructed from the LAGWRP to the Glendale Power Plant. Recycled water is used as make-up water in the power plant cooling towers and for irrigation by Caltrans in the area of Freeways 5 and 134.

**2. Forest Lawn Project** – This project, completed in 1992, was a joint project with the City of Los Angeles. This facility, a 30-inch diameter pipeline project, was constructed to deliver recycled water for irrigation to Forest Lawn Memorial Park in South Glendale. Recently, the City began deliveries to an irrigated street median on Brand Boulevard from Colorado Boulevard and Los Feliz Boulevard. Los Angeles proposes to extend the system from its South Glendale terminus into Elysian Park and into the downtown Los Angeles area.

**3. Expansion Project** - In the late 1980's, planning was initiated on expanding the recycled water system. Construction started in the early 1990's for the \$16 million project and completed by 1992. The system was extended in three phases to complete the backbone of the distribution system. The expanded system will also be used to deliver water to cities of Pasadena and Los Angeles who are partners in the project. Each segment is discussed below:

**3A. Verdugo – Scholl Project** – The project was designed to deliver recycled water to the Oakmont Country Club for irrigation with another section in Glenoaks Canyon to deliver recycled water to the Scholl Canyon Golf Course for irrigation, and to the Scholl Canyon Landfill for dust control and irrigation. Another major user of this water is Caltrans for irrigation along the 134 and 2 Freeways. Additional users include schools, parks, and roadway median strips.

The portion of the project up to Scholl Canyon was a joint effort with the City of Pasadena. Pasadena provided funds for Glendale to increase the size of the facilities so deliveries could be made to Pasadena from the Scholl Canyon area. Pasadena continues to review the possibility to extend the system.

**3B. Brand Park Project** – Consists of a pumping plant, storage tanks, and pipeline and connections to its pipeline serving the Glendale Power Plant and extending to a tank above Brand Park. This section delivers recycled water for irrigation to Brand Park, Grandview Cemetery and along the street medians on Glenoaks Boulevard.

The installation of the swivel-el is also being considered at major users to provide continuous service for their irrigation needs. The City also has a chlorination program in place for their storage facilities to assure that good quality recycled water is served and prevent growth inside storage facilities and main distribution lines. The program was proven effective when one of the tanks scheduled for service (expecting substantial amount of sediments that was experienced before chlorination) had had very small amounts of sediments.

#### **D. RECYCLED WATER DELIVERY SYSTEM**

The recycled water delivery system comprises of 20 miles of mains, 5 storage tanks, 6 pumping plants and 40 customers currently using about 1,800 AFY. The specific features of this recycled water program are shown in more detail on Figure 4 & 21. The current users from the various recycled water projects are tabulated and shown on Figure 22. This will give the reader a general idea of the scope of the expansion program. Recycled water use has increased from 430 AF in 1990-91 to 1,738 AF in 1999-2000. A drop in usage was experienced in 2004-2005 due to frequent plant shut-downs as needed on the construction at the plant to improve its reliability in the future. The expected deliveries from the various projects are shown on Table V-2. The objective is to increase the use of recycled water to meet 10 percent of demands. This will require a significant increase in users and expansion of the system.

**TABLE V-2**  
**RECYCLED WATER USE (AFY)**

<b><u>PROJECTS</u></b>	<b><u>2000 Projection for 2005</u></b>	<b><u>2005*</u></b>	<b><u>2010</u></b>	<b><u>2015</u></b>	<b><u>2020</u></b>	<b><u>2025</u></b>
Brand Park Pipeline	170	86	170	170	170	170
Forest Lawn Pipeline	350	264	350	350	350	350
Power Plant Pipeline	450	333	450	450	450	450
Verdugo-Scholl Pipeline	1020	615	1,040	1060	1,080	1,080
Other Potential Projects	0	0	0	0	0	0
<b>TOTAL</b>	<b>1,990</b>	<b>1,298</b>	<b>2,010</b>	<b>2030</b>	<b>2,050</b>	<b>2,050</b>

\* Plant shutdowns experienced due to plant construction reduced recycled water usage.

Currently, a study is being done to extend recycled water service lines to users who have already converted their system for recycled water use such as schools and parks. Extension of service is being considered to Thomas Edison Elem. School, Cerritos Elem. School, Fremont Elem. School, Pacific Park, Polygon Homes, Toll Jr. High, Keppel High School, Hoover High and fully serve Grandview Memorial Park (a third of the area is receiving recycled water for irrigation). Future recycled water users in the City are shown on Figure 23.

## **E. WATER QUALITY**

Due to complaints from customers regarding green stains on wall sprayed by recycled water, the Water Department established a monitoring program to determine recycled water condition throughout the service area and to what extent good residual from the treatment plant is maintained. The study shows that treated water leaving the plant with chlorine residual of 5 ppm or more, was observed to have a decrease in chlorine residual to almost zero in half way of the distribution system. Turbid, smelly and dirty water have been noted on

most sampling stations. Request to increase dosage in the plant was made but golf courses adjacent to the treatment plant were highly concerned the concentration of chlorine would burn their greens.

In view of the above, the City initiated a chlorination program for its recycled water system in the early 2000. Due to the safety concern in the use of gas, chlorine tablets were used at the Glendale High pumping station. Chlorination of the tanks started gradually, tests were conducted and residual monitored until demand was met in the distribution system. Less than a year after the program was initiated, recycled water started clearing, the smell was gone, and residual started to be noticeable throughout the system. The effectiveness of the program was further proven by the small amount of sediment and sludge found during the cleaning of a tank that had previously had a large amount of sediments and growth before the chlorination. Since manual chlorination involves a lot of manpower, study of more permanent chlorination stations is being done.

#### **F. STATEWIDE RECOGNITION**

The Glendale Regional Recycled Water Delivery system received the 1996 Project of the Year award from the California WateReuse Association. The City was much honored to be a recipient of this award, considering all of the recycled water projects being constructed in California. A copy of the plaque is provided in Figure 24. WateReuse recognized the regional scope of the project and the City's commitment to recycled water use.

#### **G. RECYCLED WATER USE SERVICE REGULATION**

The City requires the use of recycled water when appropriate as determined by the City's Director of *Water & Power*. As a result, even if we cannot currently provide recycled water, the potential users may still be required to install a separate irrigation system so that recycled water can be delivered at a later date without major modifications to the irrigation system. In

these projects, the “purple” irrigation pipe and control boxes must be used. Pressure test are conducted to assure no cross-connection exists between the potable system and irrigation. Records are kept which will permit an easy conversion of the system to recycled water use in the future.

## **H. HIGH-RISE OFFICE BUILDING**

The City requires dual plumbing systems in new high-rise office buildings so as recycled water becomes available, it can be used for sanitary flushing purposes in the buildings without retrofitting. Developers of new buildings have accepted this requirement and it is routine to require this installation. A listing of office buildings with dual plumbing is provided on Table V-3.

As of April 18, 2004, Glendale Community College began using recycled water for sanitary flushing in two of their dual-plumbed buildings. They are also in the planning process to add another dual plumbed building. Due to the State’s recent concern in the installation of a swivel-el connection for dual plumbed connections and limit its use for irrigation purpose only, users that do not have dual-plumbing system are required to apply the “air-gap” method for backflow prevention. This connection can be used in case of any service interruption or system shutdown from the LAGWRP due to maintenance, power failure, etc.

**TABLE V-3****Office Buildings Dual Plumbed to Use Recycled Water for Sanitary Programs**

<b><u>Location</u></b>	<b><u>Stories</u></b>
655 N. Central Avenue	24
Brand Boulevard	15
Brand Boulevard	15
Glendale Police Building	2
Glendale Library Community College Classroom	4

The City is committed to expand the use of recycled water as time goes on. Glendale is the only city in Southern California, except the City of Irvine, that has a dual plumbing requirement for office buildings, and has implemented the requirement.

## **I. ENCOURAGING RECYCLED WATER USE**

Glendale has extensively promoted the use of recycled water from traditional irrigation project use to dual plumbed office buildings using recycled water. With the incentive rate of twenty five percent less than the cost for potable water, recycled water use and service connections increased from 3 connections and 333 AF in 1990 to 43 connections and 1,298 AF consumed by the end of FY 2004-2005, respectively. To date, 11 facilities have constructed and retrofitted their irrigation systems for future recycled water use, 3 under construction, and 5 in the planning stage.

TABLE V-4

**ACTIONS USED TO ENCOURAGE RECYCLED WATER USE**

<b><u>Methods</u></b>	<b><u>Used</u></b>
Subsidized Costs	Yes
Grants	Yes/No
Dual Plumbing Standards	Yes
Regulatory Relief	No
Regional Planning	Yes
Incentive Program	Yes
Long Term Contract	Yes
Rate Discount	Yes
Prohibit Specific Fresh Water Use	Yes
Low Interest Loan	No
Public Education and Information	Yes
Require Recycle Water Use	Yes
Others	

The City encourages recycled water use by providing water at a 25 percent discount from the potable water rates. This is designed to assist users in the costs incurred in converting to recycled water use, regulatory involvement in the use of recycled water, etc. For major users, this can be a major savings in water costs. Table V-4 summarizes the many actions to encourage recycled water use.

## **VI. FINANCIAL AND REVENUE IMPACT**

The purpose of this section is to provide information on the financial and revenue impacts on water use associated with reduced water sales. The revenue for operation of the water operation comes from primarily two sources – a fixed meter charge that is collected to all water meters on the water system, and a commodity charge based on the volume of water used during the billing period. The meter charge is fixed and not a function of water used. This provides a fixed source of income.

During periods of high water sales, typically associated with years of high temperature and below normal rainfall, the revenue generated by the water operation increases. During lower demand periods usually associated with wet years or times of either mandatory or voluntary conservation, the revenue is reduced. Because of these differing conditions, the utility must maintain sufficient financial reserves to take care of the differing revenue years.

An evaluation of differing water use patterns and their impact on the financial operations of the utility is discussed and evaluated in the Urban Water Demand Management Process.

### **A. LOW DEMAND PERIODS**

During lower water demand periods, there is a reduction in water sales and revenue. This period could occur during the early stages of a drought when an agency maintains a public education program to encourage customers to reduce water use. This will result in a general reduction in revenues. This requires the utility to use accumulated reserves to finance operations. If financial resources are not available, the utility has to look at reducing costs, raise water rates, or a combination of the two. This situation, if it goes over a period of years, can adversely affect the finances of the utility.

This was the situation during the drought of the late 1980's and early 1990's. If the sustained

drought condition results in mandatory reduction in water use, the financial consequences to the City are different. Table VI-1 provides a list of some of the components discussed in this report. Some of the methods to overcome the financial impacts are presented in Table VI-2.

**TABLE VI - 1**  
**COMPONENTS OF REVENUE IMPACT**

<u>Components</u>	<u>Discussed</u>
Review of rate adjustment	YES
Development of reserves	YES
Change in quantity of sales	
Impact on customer's bill	YES
Distribution of customer impacts between customer types	YES
Impacts to water supplier of higher rates and penalties	YES
Cost recovery reviews	YES

**TABLE VI - 2**  
**METHODS TO OVERCOME REVENUE/EXPENDITURE IMPACTS**

<u>Methods</u>	<u>Used</u>
Reserve fund	YES
Change rate structure	YES
Reduce overhead	YES
Decrease capital expenditures	YES
Revise planning estimates	YES
Others	

## B. DROUGHT PERIODS

During times of mandatory conservation and implementation of the City's Mandatory Water Conservation Plan, there is a provision that allows the City to adjust the "adjustable portion of the water rate" (Section 13.08. – 15OA) that allows a "water conservation surcharge adjustment reflecting revenue shortages resulting from the implementation of water conservation measures." This provision is designed to make the water operation financially "whole" during such reduced water sales periods. An interesting community reaction to this was "paying more money for less water" during a drought period.

## C. PENALTIES AND CHARGES DURING MANDATORY CONSERVATION

As previously presented, during implementation of the City's Mandatory Water Conservation Plan, penalties are imposed on a customer who uses more than their allocation during these periods. The specific provisions are noted below.

- "1. a. If water is used during any allotment period in excess of the amount allotted for that period, a surcharge shall be imposed on said excess at **double** the basic rate established by the Department in the applicable rate bracket for each one hundred (**100**) cubic feet of water in excess of the allotted amount thereof."
- b. Notwithstanding the provisions of subsection (**a**) of this section, if water is used in excess of the amount allocated for each period in two (**2**) or more successive and consecutive periods, a surcharge shall be imposed on all water used in excess of the amount allocated for the second consecutive period and all other successive consecutive periods in which the excess use occurred. The surcharge imposed by this subsection shall be quadruple the basic water rate established by the Department in the applicable rate bracket for each one hundred (**100**) cubic feet of water used in excess of the allotted amount."

These penalties provide a strong initiative to comply. If a customer has repeated violations, in addition to the penalties, the City can install a “flow restricting device” to physically reduce the amount of water use or, as a last resort, terminate their water service.

From a water supplies perspective, the water agency faces financial penalties in the purchase of water from a wholesaler if the local water retailer is not able to reduce water use because customers fail to conserve. In theory, the money collected from the customer is used to possibly cover the added expense of purchasing extra water from the wholesaler.

#### **D. SUMMARY**

There are financial impacts to the water system from reduced water deliveries. As the severity of the shortage continues, there are major financial impacts on the customers, both in terms of higher water rates and penalties for use in excess of allocation, and the retailer, like the City, paying more to the wholesaler.

## VII. WATER CONSERVATION

### A. CONSERVATION AND PUBLIC AFFAIRS PROGRAMS

The City of Glendale is an original signatory to the 1990 Urban Water Agencies/Environmental Interests Memorandum of Understanding (MOU) incorporating the Best Management Practices (BMPs). A water agency signatory to the MOU agrees to implement the BMPs, in good faith, as long as the implementation is cost effective for the utility.

To help in carrying out this commitment, Glendale *Water & Power* funds a number of water conservation programs and activities. Our free **Smart Home Energy and Water Surveys Program** educates our customers in water and energy efficiency as well as providing installation of conservation devices. GWP offers rebates on home appliances and low-flush toilets through our **Smart Home Energy and Water Rebates Program**. For a number of years, we have funded a 6<sup>th</sup> grade electric and water conservation curriculum.

Our Public Education Coordinator distributes water conservation literature and tips to our customers at various public functions around the City. To further encourage our customers to learn how to use their water and electricity more efficiently, in October 2004, we inaugurated a Water and Energy Expo. This will be a continuing yearly event every October.

Other departments in the City of Glendale help to satisfy Glendale *Water & Power's* BMP requirements with overlapping services, educational programs and inspections.

### B. BEST MANAGEMENT PRACTICES

#### **BMP #1 - WATER SURVEY PROGRAMS FOR SINGLE-FAMILY AND MULTI-FAMILY RESIDENTIAL CUSTOMERS**

Glendale *Water & Power* provides free residential water conservation surveys and education to our single-family and multi-family water customers through our Smart Home Energy and Water Survey program. In addition to analyzing energy use, this program checks water flow rates at all sinks, showers and toilets, and landscape water usage in single-family homes.

Water-saving devices such as low-flow showerheads and kitchen faucet aerators are installed during the survey as well as toilet dams and flappers in older model toilets. This program has provided 3,816 surveys since July 2001. The installations during the surveys saved an estimated 59 acre-feet of water in 2004.

The curriculum in our school program, LivingWise, also includes an assignment for a do-it-yourself residential water and electric survey to be completed by the students and their families. The kit that accompanies this program provides a low-flow showerhead and water efficient faucet aerator for the student to install in their home.

## **BMP #2 – RESIDENTIAL PLUMBING RETROFIT**

GWP installs free water conservation measures during our Smart Home Energy and Water Surveys. This program has installed 3,246 low flow showerheads, 7,666 faucet aerators, 2,159 toilet displacement devices, and 149 toilet flappers since June 2001. These installations saved an estimated 59 acre-feet of water in 2004.

Low-flow showerheads are also given away at special events and are offered, at the wholesale price, to Glendale customers at the GWP cashier's window.

## **BMP #3 – SYSTEM WATER AUDITS, LEAK DETECTION AND REPAIR**

Glendale *Water & Power* meters all delivered water. Annually, GWP completes a

prescreening system audit to determine if there is the need for a full scale system audit.

GWP began filing BMP reports in 1999. Since that time, our unaccounted water losses have been consistently less than 10%. System variable uses include reservoir cleaning and line flushing. In 2001, GWP began a multi-year citywide water system replacement/rehabilitation program.

#### **BMP #4 - METERING WITH COMMODITY RATES FOR ALL NEW CONNECTIONS AND RETROFIT OF EXISTING**

Glendale *Water and Power* requires metering for all connections, existing and new. GWP also bills by volume-of-use.

A majority of our residential accounts have mixed use meters. There are a small number with dedicated landscape meters. Most of our large commercial and industrial accounts have dedicated meters, one for inside use and another for outside (landscape) use.

GWP has an extensive recycled water system. Since recycled water is used for irrigation of landscape, our recycled water accounts have dedicated landscape meters. All new commercial buildings in our downtown area are required to include a dual-plumbing system in their construction, to enable them to use recycled water when our system is expanded. They will be dual metered for potable drinking water and recycled water for inside sanitary purposes and outside landscape purposes.

#### **BMP #5 - LARGE LANDSCAPE CONSERVATION PROGRAMS AND INCENTIVES**

Glendale *Water & Power* has not yet implemented this BMP. However, our Large Landscape Water Survey program is in the final planning stage and we anticipate that it

will be implemented during Fiscal year 2005-2006.

Within the plan, we have made available funding to provide our large landscape accounts with full irrigation audits and the creation of water budgets, as well as training and incentives to improve landscape water use efficiency.

GWP provides free landscape water conservation education through the Metropolitan Water District's "Protector Del Agua" program. Since July 2001, 60 employees from Glendale's Park and Recreation Department and 15 Glendale Unified School District's Landscape Maintenance Technicians have completed the program.

#### **BMP #6 - HIGH-EFFICIENCY CLOTHES WASHING MACHINE FINANCIAL INCENTIVE PROGRAMS**

Glendale *Water & Power* provides rebates to our customers for purchases of high-efficiency clothes washers through our Smart Home Energy and Water Rebates program. Appliances and devices are evaluated on ENERGY STAR® qualifications as well as water factor values.

The rebate program began in July 2001. 2,028 ENERGY STAR® clothes washers have been rebated during the program. Since March, 2004, when BMP #6 was revised, GWP has provided rebates on 681 high efficiency washers. 237 were on the CEE Tier 1 list at 9.5 water factor (WF) or less and 444 had a WF of 6.0 or less. For a high efficiency washer purchased from a Glendale dealer, customers receive a rebate of \$125. If the appliance is purchased from a dealer outside of Glendale, the rebate is \$100.

Assumptions for figuring the gross amount of water savings in gallons from our financial incentive program:

13.3 is the Baseline WF for washers sold in 1994.

14 years is the assumed average useful life of residential washers.

1,170 gallons/year is the average change in water use for a unit change in water factor.

The water savings realized from the purchase of these appliances is at least 4,850,000 gallons of water per year which equates to over 11 ½ acre feet per year. Using the value developed by the California Energy Commission, this computation is based on the average change in water use for a unit change in WF.

## **BMP #7 - PUBLIC INFORMATION PROGRAMS**

Glendale *Water & Power's* Communications and Public Education Coordinators work directly with other City divisions, community-based organizations, non-profits, and service clubs on a variety of levels to disseminate information and increase awareness of water-related issues.

The GWP Communications Coordinator is the editor of our bi-monthly newsletter, "the Source". It is mailed directly to every customer who receives a water and/or electric utility billing from GWP - residential, commercial, institutional and industrial. This publication has been received well by our customers and has become a major source of information for them. A recurring feature in the newsletter is the "Conservation Corner" where water and electric savings tips are highlighted. This newsletter is also distributed to City employees and displayed on all City Departments' public counters.

Glendale *Water & Power* also is responsible for one page in the quarterly City government newspaper, *City Views*. This is another source of information for our customers.

Under the supervision of the GWP Public Education Coordinator, GWP employees staff booths and information tables at many civic events. They distribute conservation

literature, information about our water saving programs and answer questions about our utility.

Our Public Education Coordinator is also the project manager for our Annual Water & Energy Expo held in October. GWP employees from all sections of our utility set up booths and demonstrations for our customers. Materials encouraging conservation by school age children are distributed as well.

At the present time, GWP is working on a number of major water and electric projects in the City. For each project, we produce and mail informational brochures to the customers in the areas affected by that project.

Glendale *Water & Power* also publishes and/or distributes materials on groundwater protection, water quality, and issues pertaining to water in California

## **BMP #8 - SCHOOL EDUCATION PROGRAMS**

Glendale *Water & Power* has made a strong commitment to support educational excellence in Glendale schools. With this in mind, GWP provides LivingWise, a water and energy classroom program to 6<sup>th</sup> grade students in both public and private Glendale schools. Since the program began in 2001, more than 80 teachers and more than 6,000 Glendale students have participated in this successful project.

The program was created by a group of teachers for the National Energy Foundation. It is a comprehensive set of 17 hands-on learning activities that use science and other core subjects to teach that “LivingWise” means being “water wise”, “energy wise”, and making ‘wise’ choices to protect the environment.

Each teacher and student receives a LivingWise 86 page workbook and a kit filled with

such items as low-flow showerheads, kitchen faucet aerators and toilet leak detection tabs as well as an energy efficient nightlight, a fluorescent light bulb and a CD-ROM computer disk with a “conservation entertainment experience”. Because many of the lessons require the students to complete an activity at home, parents and other family members learn conservation secrets right along with their students. At the end of the program, the students practice what they have learned by installing the water and energy saving kit items in their homes.

Throughout the year, GWP also provides Glendale teachers, from all grades, with workbooks, activity books, and other materials dealing with water conservation, water quality, electricity conservation and electric safety.

## **BMP#9 - CONSERVATION PROGRAMS FOR CII ACCOUNTS**

Business Energy Solutions, a Glendale *Water & Power* program for medium and large businesses, provides incentives for these businesses to complete pre-approved energy and water audits and retrofits. Generally, medium and large businesses are defined as those having electric bills of \$3,000 or more per month. New construction can also qualify.

GWP's Business Account Representatives manage this program. The availability of rebates for water-saving devices, under this program, is dependent on the type and amount of financial incentives offered by our wholesale water provider, Metropolitan Water District (MWD).

For our small business customers, Glendale *Water & Power* offers our Smart Business Energy and Water Saving Upgrade Program. Generally, small businesses are defined as those having monthly electric bills less than \$3,000. After a water and electric usage survey, GWP provides a customized Savings Report which includes a recommended list of energy and water upgrades. The business owner may choose up to \$1,000 worth

of upgrades from this list which GWP will install free of charge.

GWP participates in MWD's "Save Water, Save a Buck" program. This program provides rebates to small businesses for replacing ultra low-flush toilets and urinals (\$60 to \$120), self-closing pre-rinse spray heads (\$50), cooling tower conductivity controllers (\$500), and coin-operated horizontal-axis washing machines (\$250).

In 2004, GWP also participated in the California Urban Water Conservation Council's "Rinse and Save Program" which provided free installation of self-closing pre-rinse spray heads for restaurants. 153 Glendale customers participated.

#### **BMP #11 – CONSERVATION PRICING**

Water rates at Glendale *Water & Power* are both volumetric and non volumetric, that is our rates reflect both a fixed meter charge and a charge that is based on metered water use. The volumetric or commodity charge portion of our rate is an "increasing block" rate structure.

#### **BMP #12 – CONSERVATION COORDINATOR**

At Glendale *Water & Power*, water and electric conservation is handled by the Marketing Section.

The Programs Manager acts as our Conservation Coordinator. The Marketing Section staff provides support for general conservation tasks, while the Communications Coordinator and Public Education Coordinator manage specific conservation programs.

## BMP #13 – WATER WASTE PROHIBITION

In 1996, by Ordinance of the Glendale City Council, Glendale *Water and Power* added a “No Water Waste Policy” to the Water Conservation Section of the City’s Municipal Code. The Water Conservation Section of the Glendale City Municipal Code can be found, in its entirety, in the Appendix C of this document.

The Policy for this ordinance is, in part, *“because of conditions prevailing in the City and in areas of this state and elsewhere from which the City obtains its water supplies, because water needs are projected to increase in the future and while water is a renewable resource, it is a finite one, the general welfare requires that the water resources available to the City be put to the maximum beneficial use to the extent to which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented .....*”

The Purpose for this policy is to *“provide a mandatory water conservation plan to .....significantly reduce the consumption of water over an extended period of time thereby extending the available water required for the customers of the City.....”*

The “No Water Waste Policy” lists the following 12 “prohibited uses applicable to all customers”:

- “There shall be no hose washing of sidewalks, walkways .....
- “There shall be no use of water for any purpose which results in overspray, runoff .....
- “No water shall be used to clean, fill or maintain levels in decorative fountains or similar structures unless such water is part of a recirculation system .....
- “No customer of the Department shall permit water to leak from any facility on his premises; failure to affect the repair of any leak within 72 hours .....shall subject said customer to all penalties provided .....
- “No landscaped or vegetated areas .....shall be watered, sprinkled, or irrigated

- between the hours of 10:00 am and 5:00 pm .....
- “The washing of commercial and non-commercial privately owned automobiles, trucks, trailers .....is restricted to use of a hand-held bucket and quick rinses using a hose with a positive shut-off nozzle .....
  - “Owners of outdoor swimming pools, wading pools or spas, when these are not in use, are requested to use covers .....
  - “Water for construction purposes .....shall be used in an efficient manner which will not result in runoff .....
  - “The use of potable water from fire hydrants shall be limited to fire fighting .....
  - “No restaurant .....where food is sold, served or offered for sale, shall serve drinking water .....unless expressly requested by the customer.”
  - “Hotels and motels are requested to post notices .....urging guests to conserve water.”

In addition to the above water conservation prohibitions, the Ordinance outlines additional Mandatory Water prohibitions, on an increasing basis, dependent on the percentage of conservation required in the event of a mandatory water use curtailment due to a drought or major catastrophe. The Ordinance also provides for and enumerates the penalties for failure to comply with the water conservation provisions within this chapter of the Code.

#### **BMP #14 – RESIDENTIAL ULFT REPLACEMENT PROGRAMS**

Glendale *Water & Power*, through our Smart Home Energy & Water Saving Rebates Program, provides single-family and multi-family customers with rebates for ultra low-flush toilets (1.6 gallon or less per flush).

If the toilet is purchased from a Glendale dealer, the rebate is \$100 per unit. If the toilet

is purchased from a dealer outside of Glendale, the rebate is \$80 per unit.

In 1993 and 1994, GWP paid rebates for 1,292 ULFT replacements for single-family customers and 1,503 ULFT rebates for multi-family customers.